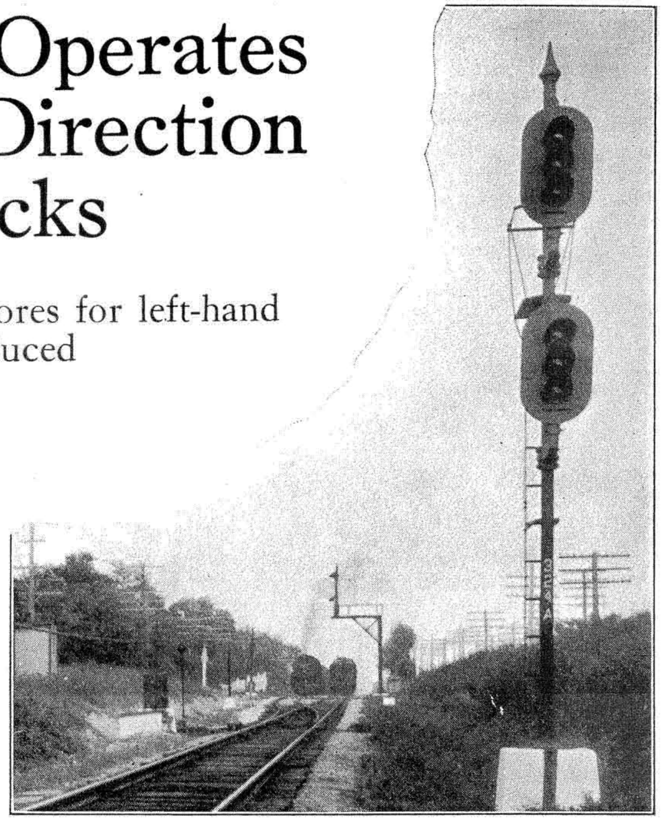
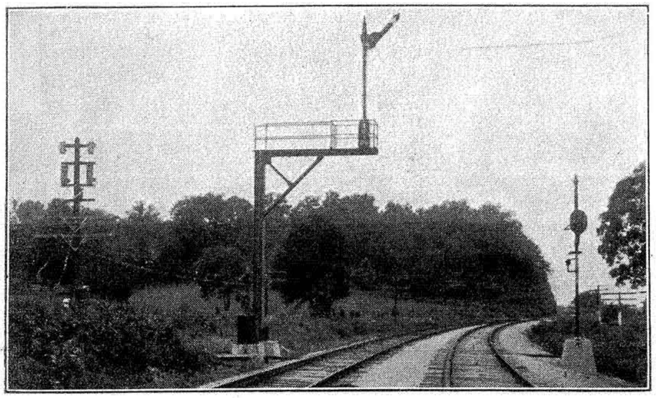
Missouri Pacific Operates Trains in Either Direction on Both Tracks

Light signals for right-hand and semaphores for left-hand running—Written orders reduced

FOR the last three years the Missouri Pacific has been working on the realinement and second tracking of its line between Kirkwood, Mo., and Jefferson City, a distance of 111 miles upon which is handled all freight and passenger traffic of this road between St. Louis and the west. Double track with right hand running has been in use between St. Louis and Kirkwood, 12.9 miles, for about 44 years. The new work has been concentrated at different sections where the greatest relief from congestion could be



Westbound freight train approaching west end of double track at Allentown as eastbound passenger train passes remote power switch in foreground



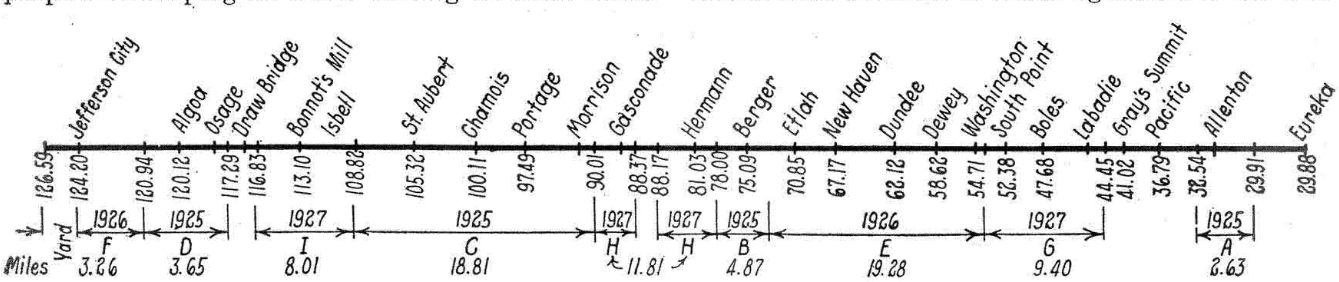
Single westbound location, semaphore for left track and light signal for right

secured quickly. For example, between Eureka, 30 miles from St. Louis, and Jefferson City, six separate projects were under way, four of which were placed in service in 1925 and two are well under way so that a total of 52.27 miles of double track is now nearly complete and the 1927 program includes other sections totaling 29.22 miles.

In order to utilize this new double track to the best advantage, trains are operated in either direction on both tracks, depending on traffic conditions, for the purpose of keeping all trains moving on main tracks rather than waiting on sidings for meets. In order to facilitate such operation it was decided to equip each track with automatic signaling in the same manner as a single track railroad; in other words, to provide signals for either direction on each track. In order to eliminate any confusion between signals for one direction on the two tracks color-light signals are employed for right hand and semaphore signals for left-hand running. In view of the fact that the single-track line had been equipped with direct current semaphore signals of comparatively modern design in 1904 and 1917, it was practical to use all the semaphore signals and considerable of the balance of this apparatus for the new signaling of the double track.

Layout of Signaling and Method of Operation

As immediate relief was necessary the first problem was to utilize the sections *A, B, C* and *D,* as shown in the sketch, which were completed in 1925. Where practicable mechanical interlocking plants were employed to operate the switches and signals at one end of a piece of double track while the other end was operated by remote control switch machines controlled from the same interlocking station or the nearest telegraph operator's office. On one of the sections a double set of crossovers was installed in approximately the center, these crossovers being interlocked, and the operator at that point controls movements of trains on either track and operates



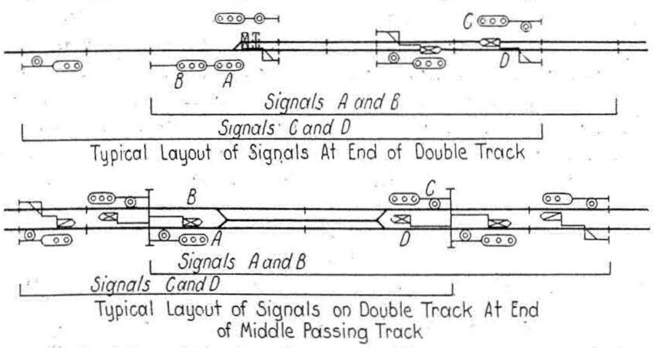
Section of line where reverse operation on double track is utilized to increase traffic capacity

both ends of the double track with remote controlled switches. Movements over the double track, when under the control of the operator, are directed by signal indication without written train orders, thereby eliminating train stops to pick up orders. With this equipment the sections of double track were used not only as long passing tracks but also as running tracks for movements in either direction. This method of operation assisted considerably in relieving congestion. When the two sections *F* and *E* are

Semaphore signals for left hand running on top of bridge and light signals for right hand on side of bridge leg

completed greater flexibility and capacity will of course be available.

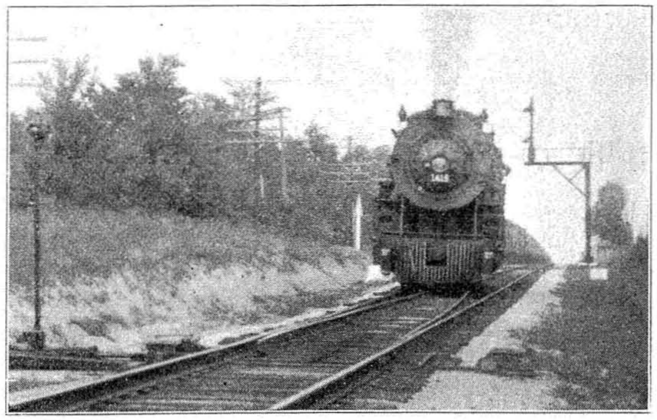
On the completed double track each track is signaled to meet the conditions of grade, curvature and spacing between stations. When practical to bring the four signals together at one location a bridge is provided, the semaphore signals for left-hand running being on the top of the bridge and the color-light signals for right-hand running being mounted



Method of locating signals to provide proper protection at end of double track and a center passing track

on the face of the bridge leg. This arrangement allows a sufficient difference in location to prevent any confusion in signal indication. The signals, which are electrically lighted, are controlled by the approach of a train so that only one light indication appears before a train. If two trains are running side by side in the same direction the difference in the types of indications as well as their relative locations will prevent any confusion of indications. In all cases the signal governing a movement over a track is located immediately to the right of or over the right rail of the track governed.

The method of locating the signals to give the protection required is shown in the accompanying sketch,

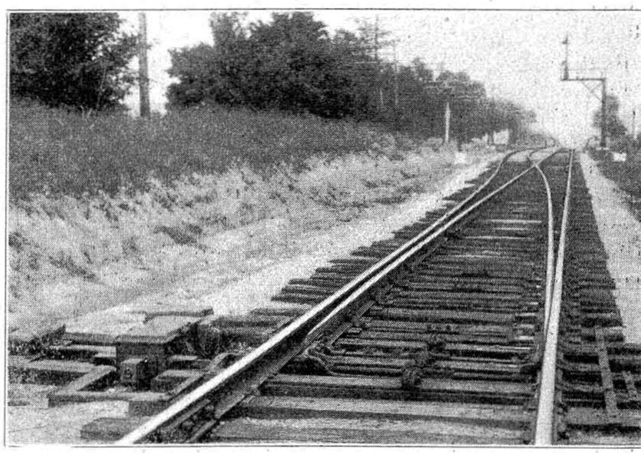


Freight train pulling out at end of double track at Allentown after passenger train has cleared

illustrating layouts at the end of double track and at one of the new center passing tracks. The signals are controlled on the regular single track overlap method, that is, a signal holds the stop position until the rear of a train has passed braking distance beyond the next signal in advance, thus giving a spacing between trains of a full block and braking distance.

Advantages of Either-Direction Operation

There are several advantages in this method of operation over regular double-track operation, among them being that a freight train is not detained on a siding to be passed by a passenger train, except where opposing trains are using the opposite track. Frequently, on the stretch of track having double crossovers in the center, three or more trains are kept moving while being met or passed. At stations where the community is practically all on one side of the railroad, the passenger trains may be routed on



Close-up of remote power switch layout at Allentown

the left hand track, permitting freight movements to be made on the opposite track at regular speed without any danger or delay to passengers. Should one of the tracks be blocked no special precautions are necessary to make movements in either direction on the opposite track. Local trains running in either direction may set out their industry loads without blocking both main lines in making this move. Other advantages are apparent to operating officers.

A new signal pole line was built with 35 creosoted pine poles to the mile. Oregon fir crossarms were used. The two No. 4 stranded aluminum cable conductors for the single-phase 4,400-volt feeder system were supported on No. 12 Locke porcelain insulators on the top 4-ft. crossarm. The lower 10-ft. crossarm carried the No. 12 bare hard drawn copper line wires for the signal circuits. Where the 110-volt circuit is carried out to a cut section to feed track circuits, the two 110-volt feed wires are carried on white insulators and the remaining 8-volt control circuits are carried on brown glazed insulators. The "Fuswitch" cutout boxes mounted on the crossarm, through which the feed circuit is controlled, were furnished by the W. N. Matthews Corp., St. Louis, Mo. Never-Creep guy anchors manufactured by the Chance Company, Centralia, Mo., were used as standard construction.

The color-light signals used on this installation are the Handlan-Buck type using 25-watt 8-volt lamps. The old semaphore signals are the Union Switch & Signal Company Style-B, Federal Signal Co. Style 4-A and General Railway Signal Co. Style 2-A. The relays, etc. were furnished by the various signal companies and the United Electric Apparatus Co. All construction work was handled by the Missouri Pacific signal forces, under the jurisdiction of the signal engineer's office.

Electrification Proves Merits of Welded Rail Bonds

By W. P. Bovard

Track Material Engineer, Ohio Brass Company, Mansfield, Ohio

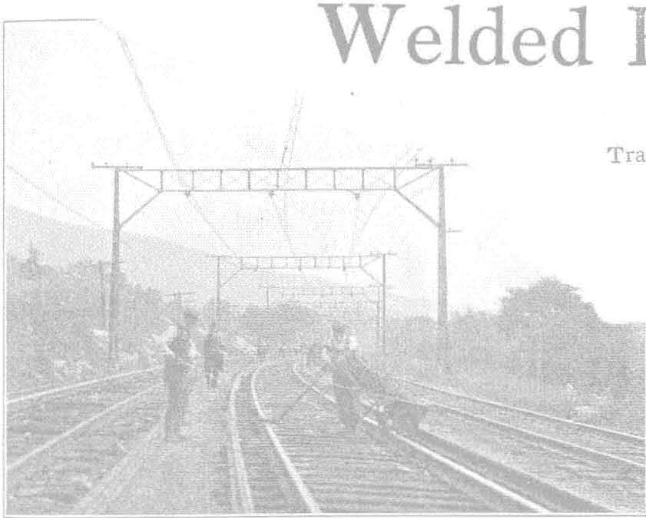


Fig. 1—Bonding and rail laying crews on the Boston & Maine

THE evolution in methods of bonding track rail which has taken place during the past several years has had marked influence on railway operation. Beginning in the year 1914 with oxy-acetylene welding of copper rail bonds on one of the smaller railroad electrifications, the process of welding has seen adoption on many of the important electrifications. It is widely used for track circuit bonding in automatic block signal service and several installations are in use for automatic train control.

Both oxy-acetylene welding and the electric arc are extensively used in the electric railway field for bonding track.

Where only a few years ago the railway electrification engineer went ahead rather boldly and in the face of criticism to apply welded bonds, he now finds it necessary to refer only to numerous installations under widely varying conditions for proved service and economies.

The Boston & Maine has adopted gas-weld bonds for maintenance in their Hoosac tunnel electrification at North Adams, Mass. This is an 11,000-volt single phase installation and No. 4/0 capacity bonds on both rails prove ample for track return.

The initial installation of gas-weld bonds was made on new rail which was bolted and bonded before being thrown into place in long lengths, without traffic interference. The bonding crew is shown in Fig. 1, with rail gang in background. A "close-up" of the Boston & Maine bonding over heavily beaded joints is shown in Fig. 2, and represents the helper holding the bond in position until "tacked."

When the Baltimore & Ohio decided to electrify its extensive transit property on Staten Island, N. Y., the company used gas-weld bonding. Rail in this case is 100-lb., with 4-bolt heavily beaded angle bars.

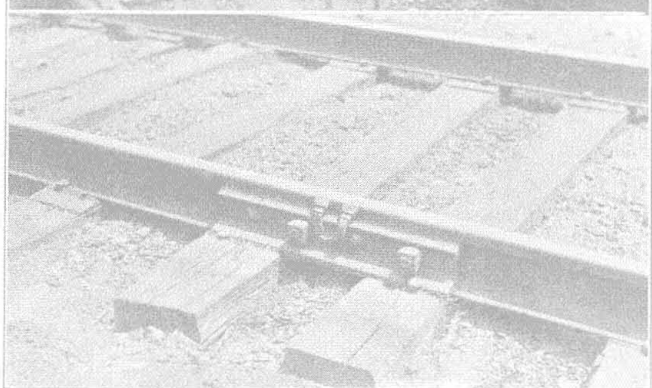


Fig. 2 (Above)—Close-up of Type-ST2 bond as installed on the Boston & Maine
Fig. 3 (Below)—Another view of the Type-ST2 gas weld bond

With 600-volt propulsion, heavy currents were required to handle long trains of multiple unit passenger equipment.

A special 250,000 c.m. 13½ in. length gas-weld bond was adopted, placing two bonds per joint. By